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Material - Titanium - Ti 2.5Al 5Sn

Mechanical Properties of Hot Formed Sheet

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Mechanical Properties of Hot Formed Sheet

Abstract Laboratory test to determine the effect of hot forming upon the mechanical properties of Ti-2.5Al-5Sn alloy. Ti 2.5Al 5Sn sheet, 0.050 inch thick, was stretch wrapped at various rates and held for various times after wrapping against a stretch forming die which was heated to 1150°F. This treatment resulted in tensile losses of from zero to 3 per cent; ultimate strength losses of from zero to 6 per cent; elongation losses averaging about 2.5 per cent of the original elongation; and compression yield strength losses ranging upwards to 7 per cent. In general, the property losses were very slight.

References: Bergstedt, P. W., Turner, H. C., Sutherland, W. M., "Mechanical Properties of Hot Formed 5Al-2.5 Sn Titanium Alloy*," General Dynamics/Convair Report MP 59-103, San Diego, California, 19 March 1959. (Reference attached).

*Alloy improperly designated, should be Ti 2.5Al 5Sn titanium alloy.

CONVAIR
A DIVISION OF GENERAL DYNAMICS CORPORATION
SAN DIEGO

STRUCTURES & MATERIALS LABORATORIES

REPORT MP 59-103
DATE 19 March 1959
MODEL F-106

TITLE

REPORT NO. MP 59-103

MECHANICAL PROPERTIES OF HOT-FORMED 5Al - 2.5 Sn TITANIUM ALLOY

MODEL: F-106

CONTRACT NO. AF33(600)-33808

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INTRODUCTION:

Considerable difficulty has been experienced recently in Plant II in the cold-forming of 5Al-2.5 Sn titanium alloy. Some of this material has proved hyper-sensitive to stress-corrosion cracking; finger-prints upon formed parts have caused cracks to develop before or during the stress-relief operation.

In an attempt to circumvent this problem, the Engineering Producibility Group hot-stretch-wrapped several of the parts. This report describes the evaluation of six (6) of these parts by the Materials and Processes Laboratory.

OBJECT:

To determine the effect of hot-forming plus short-term soak upon the mechanical properties of Ti-5Al-2.5 Sn alloy.)

CONCLUSIONS:

Based upon control-specimen average properties, the following hot-forming effects were noted:

1. Ultimate tensile strength was raised. Strength increases ranged from 0 to 6%.

2. Tensile yield strength was reduced; maximum loss incurred was 3%.

3. Elongation losses were quite uniform; maximum loss was 2.5% (16.7% of the as-received elongation).

4. Compression yield strength was lowered. The maximum loss was 7%.

PROCEDURE:

All material, including flat control sheet, was 0.050" nominal Ti-5Al-2.5 Sn alloy from Heat No. 8419 of Titanium Metals Corporation of America.

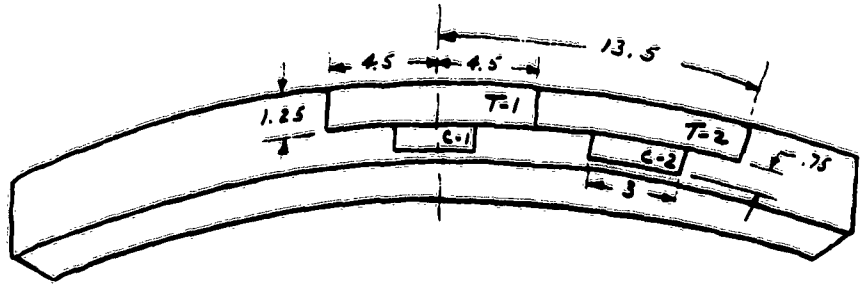
The configuration of the hot-formed parts, the processing notes, and the sampling plan are included with the attached tabulation of results.

All specimens were tested in a Tinius-Olsen Universal Testing Machine. Both tension-yield and compression-yield were taken at 0.2% offset.

RESULTS AND DISCUSSION:

The results of the mechanical tests are listed on the attached form which was submitted by the Producibility Group. The changes in properties (reported under "Conclusions") suggest that this hot-forming procedure is relatively harmless when applied to the Ti-5Al-2.5 Sn alloy. The most significant reduction occurred in the compression yield strength; however, only one specimen was reduced as much as 7%. In general, the property losses were very slight.

NOTE: The data from which this report was prepared are recorded in Materials and Processes Laboratory Notebook No. 910.



Part No.	Wrap Time	Soak Time	Sample No.	UTS	TYS	%Elong.	CYS
K	As-received, control material		K-T-1	122,420	117,450	15.5	—
			K-T-2	123,200	117,200	15.0	—
			K-T-3	121,790	116,390	14.5	—
			K-C-1	—	—	—	124,270
			K-C-2	—	—	—	126,120
			K-C-3	—	—	—	123,460
1	3 min.	2 min.	1-T-1	124,000	114,580	12.5	—
			1-T-2	124,570	114,790	13.0	—
			1-C-1	—	—	—	120,140
			1-C-2	—	—	—	119,330
2	3 min.	2 min	2-T-1	124,730	115,150	12.5	—
			2-T-2	123,070	114,280	13.0	—
			2-C-1	—	—	—	121,870
			2-C-2	—	—	—	120,950
3	3min.	5 min.	3-T-1	122,240	113,890	13.5	—
			3-T-2	123,230	113,450	13.0	—
			3-C-1	—	—	—	119,290
			3-C-2	—	—	—	118,970
4	3min.	5 min.	4-T-1	124,390	114,190	13.0	—
			4-T-2	126,470	113,800	12.5	—
			4-C-1	—	—	—	119,340
			4-C-2	—	—	—	119,460
5	3min.	10min.	5-T-1	124,310	114,550	13.0	—
			5-T-2	125,360	114,970	13.0	—
			5-C-1	—	—	—	115,590
			5-C-2	—	—	—	120,780
6	3min.	10 min.	6-T-1	129,740	118,150	12.5	—
			6-T-2	123,700	113,490	12.5	—
			6-C-1	—	—	—	119,250
			6-C-2	—	—	—	119,860

NOTES: All material was 5Al - 2.5 Sn from TMCA Heat No. E419.
All parts stretched to 10% elongation.
All parts formed at 1100°F.
TYS & CYS taken at 0.2 % offset.